

WHAT IS CLAIMED IS:

1. A vertebral alignment assembly comprising:

a screw comprising an elongated, partially cannulated shaft defining an axially arranged inner screw chamber and a screw axis, an axial opening being arranged at the proximal end of the shaft providing access to the inner screw chamber of the shaft and a tapered tip arranged at the distal end of the shaft, and wherein the distal end of the shaft is externally threaded for driving the screw into bone and wherein the proximal end of the shaft further comprises an anchor mechanism for attachment of at least one piece of fixation attachment hardware; and

an alignment rod comprising an elongated shaft with an engaging portion arranged at the distal end of the shaft designed to insert into the axial opening and cooperatively engage the inner screw chamber of the shaft, and an elongated portion arranged at the proximal end of the shaft, the elongated portion of the alignment rod having an outer diameter less than or equal to that of the screw.

2. A vertebral alignment assembly as described in claim 1, wherein the inner screw chamber of the shaft and the engaging portion of the alignment rod further comprise engagement mechanisms designed to cooperatively engage to lockingly hold the engaging portion of the alignment rod within the inner screw chamber of the screw shaft.

3. A vertebral alignment assembly as described in claim 2, wherein the engagement mechanism is selected from the group consisting of: a threaded fitting, a compression fitting, and a twist and lock mechanism.

4. A vertebral alignment assembly as described in claim 1, wherein the inner screw chamber of the shaft is at least partially threaded and wherein the engaging portion of the alignment rod is threaded to cooperatively engage the threads of the inner screw chamber to lockingly hold the engaging portion of the alignment rod within the inner screw chamber of the screw shaft.

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5. A vertebral alignment assembly as described in claim 1, wherein the inner screw chamber further comprises at least one anchor recess and wherein the engaging portion of the alignment rod further comprises at least one engagement anchor designed to compressively engage with the at least one anchor recess of the inner screw chamber to lockingly hold the engaging portion of the alignment rod within the inner screw chamber of the screw shaft.

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6. A vertebral alignment assembly as described in claim 5, wherein the shaft of the alignment rod is partially cannulated to form a rod chamber axially disposed therein and wherein the rod chamber has an axial opening provided at the handle end of the alignment rod and at least one radial opening at the engaging end of the alignment rod within which the at least one engagement anchor is movably disposed between a disengaged position within the rod chamber and an engaged position where at least a portion of the engagement anchor projects outward from the wall of the alignment rod shaft, the alignment rod further comprising an activation rod slidably disposed within the rod chamber such that the proximal end of the activation rod extends out of the axial opening and the distal end extends into the chamber such that when the rod is slid in a distal direction within the chamber the distal end of the rod contacts the inner surface of the at least one outward projection such that the at least one engagement anchor is moved from the disengaged to the engaged position.

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7. A vertebral alignment assembly as described in claim 1, wherein the elongated portion of the alignment rod is threaded to receive a threaded attachment.

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8. A vertebral alignment assembly as described in claim 7, wherein the threaded attachment is either a T-type handle or a screwdriver-type handle.

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9. A vertebral alignment assembly as described in claim 1, wherein the alignment rod further comprises an elongated probe portion distal to the engaging portion, the elongated probe portion being designed to extend within and cooperatively fill the inner screw chamber.

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10. A vertebral alignment assembly as described in claim 1, further comprising a filler plug, mateable with said inner screw chamber, the plug being designed to lockingly engage within and fill the inner screw chamber.

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11. A vertebral alignment system as described in claim 1, wherein the fixation attachment hardware is chosen from the group consisting of: clamps, bolts and nuts.

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12. A vertebral alignment assembly as described in claim 1, wherein the anchor mechanism for the fixation hardware comprises external threading.

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13. A vertebral alignment assembly as described in claim 1, wherein the assembly is made of one of stainless steel or titanium.

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14. A vertebral alignment/fixation system comprising:

at least one elongated spinal adjustment device;

at least one vertebral alignment/fixation assembly comprising:

a screw comprising an elongated, partially cannulated shaft defining an axially arranged inner screw chamber and a screw axis, an axial opening being arranged at the proximal end of the shaft providing access to the inner screw chamber of the shaft and a tapered tip arranged at the distal end of the shaft, and wherein the distal end of the shaft is externally threaded for driving the screw into bone and wherein the proximal end of the shaft further comprises an anchor mechanism for attachment of at least one piece of fixation hardware, and

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an alignment rod comprising an elongated shaft with an engaging portion arranged at the distal end of the shaft designed to insert into the axial opening and cooperatively engage the inner screw chamber of the shaft, and a elongated portion arranged at the proximal end of the shaft, the elongated portion of the alignment rod having an outer diameter less than or equal to that of the screw;

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at least one piece of fixation attachment hardware designed to slide down the alignment rod and cooperatively engage the proximal anchor mechanism of the screw such that the at least one fixation attachment is fixedly attached

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thereto, the at least one fixation attachment further being designed to anchor the at least one spinal adjustment device in place.

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15. A vertebral alignment/fixation system as described in claim 14, further comprising a filler plug, mateable with said inner screw chamber, the plug being designed to lockingly engage within and fill the inner screw chamber.

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16. A vertebral alignment/fixation system as described in claim 14, wherein the spinal adjustment device is chosen from the group consisting of: plates, rods, clamps, crosslinks and wires.

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17. A vertebral alignment/fixation system as described in claim 14, wherein the fixation attachment is chosen from the group consisting of: clamps, bolts and nuts.

18. A vertebral alignment/fixation system as described in claim 14, wherein the anchor mechanism for the fixation hardware comprises external threading.

19. A vertebral alignment/fixation system as described in claim 14, wherein the inner screw chamber of the shaft and the engaging portion of the alignment rod further comprise engagement mechanisms designed to cooperatively engage to lockingly hold the engaging portion of the alignment rod within the inner screw chamber of the screw shaft.

20. A vertebral alignment/fixation system as described in claim 19, wherein the engagement mechanism is selected from the group consisting of: a threaded fitting, a compression fitting, and a twist and lock mechanism.

21. A vertebral alignment/fixation assembly as described in claim 14, wherein the inner screw chamber of the shaft is at least partially threaded and wherein the engaging portion of the alignment rod is threaded to cooperatively engage the threads of the inner screw chamber to lockingly hold the engaging portion of the alignment rod within the inner screw chamber of the screw shaft.

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22. A vertebral alignment/fixation assembly as described in claim 14, wherein the inner screw chamber further comprises at least one anchor recess and wherein the engaging portion of the alignment rod further comprises at least one engagement anchor designed to compressively engage with the at least one anchor recess of the inner screw chamber to lockingly hold the engaging portion of the alignment rod within the inner screw chamber of the screw shaft.

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23. A vertebral alignment/fixation assembly as described in claim 22, wherein the shaft of the alignment rod is partially cannulated to form a rod chamber axially disposed therein and wherein the rod chamber has an axial opening provided at the handle end of the alignment rod and at least one radial opening at the engaging end of the alignment rod within which the at least one engagement anchor is movably disposed between a disengaged position within the rod chamber and an engaged position where at least a portion of the engagement anchor projects outward from the wall of the alignment rod shaft, the alignment rod further comprising an activation rod slidably disposed within the rod chamber such that the proximal end of the activation rod extends out of the axial opening and the distal end extends into the chamber such that when the rod is slid in a distal direction within the chamber the distal end of the rod contacts the inner surface of the at least one outward projection such that the at least one engagement anchor is moved from the disengaged to the engaged position.

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24. A vertebral alignment/fixation assembly as described in claim 14, wherein the elongated portion of the alignment rod is threaded to receive a threaded attachment.

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25. A vertebral alignment/fixation assembly as described in claim 24, wherein the threaded attachment is either a T-type handle or a screwdriver-type handle.

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26. A vertebral alignment/fixation assembly as described in claim 14, wherein the alignment rod further comprises an elongated probe portion distal to the engaging portion, the elongated probe portion being designed to extend within and cooperatively fill the inner screw chamber.

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27. A vertebral alignment/fixation system as described in claim 14, wherein the system components are made of stainless steel.

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28. A vertebral alignment/fixation method comprising:
providing a vertebral alignment/fixation system as described in claim 14;
driving the screw into a vertebral body;
inserting an alignment rod into the inner screw chamber of the screw;
aligning the vertebral body with the alignment rod;
10 sliding a piece of fixation attachment hardware down the alignment rod onto

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the screw;

tightening piece of fixation attachment hardware onto the screw; and

attaching a spinal adjustment device onto the fixation attachment hardware to fix the vertebral body in the chosen alignment.

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29. A vertebral alignment/fixation method comprising utilizing a vertebral alignment/fixation system as described in claim 14 to align at least one vertebral body.

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30. A vertebral alignment/fixation method comprising utilizing a plurality of vertebral alignment/fixation assemblies as described in claim 1 to align at least one vertebral body.

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31. A vertebral alignment/fixation method comprising:
driving a partially cannulated screw into a vertebral body;
inserting an alignment rod into the cannulation of the screw;
aligning the vertebral body with the alignment rod;
sliding a piece of fixation attachment hardware down the alignment rod onto
the screw;

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tightening the piece of fixation attachment hardware onto the screw; and
attaching a spinal adjustment device onto the fixation attachment hardware to fix the vertebral body in the chosen alignment.

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32. A vertebral alignment assembly comprising:

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a vertebral anchor means for providing a stable connection to a vertebral
body comprising a partially cannulated body defining an inner anchor chamber, an
opening being arranged at the proximal end of the anchor body providing access to
5 the inner anchor chamber, wherein the distal end of the anchor means is designed
to allow fixation of the anchor means to a bone and wherein the proximal end of the
shaft further comprises an hardware anchor mechanism for attachment of at least
one piece of fixation attachment hardware; and

10 an alignment rod comprising an elongated shaft with an engaging portion
arranged at the distal end of the shaft designed to insert into the opening and
cooperatively engage the inner anchor chamber, and an elongated portion arranged
at the proximal end of the shaft, the elongated portion of the alignment rod having
an outer diameter less than or equal to that of the hardware anchor mechanism.

15 33. A vertebral alignment/fixation system comprising:

at least one elongated spinal adjustment device;

at least one vertebral alignment/fixation assembly comprising:

20 a vertebral anchor means for providing a stable connection to a
vertebral body comprising a partially cannulated body defining an inner anchor
chamber, an opening being arranged at the proximal end of the anchor body
providing access to the inner anchor chamber, wherein the distal end of the
vertebral anchor means is designed to allow fixation of the vertebral anchor means
to a vertebral bone and wherein the proximal end of the shaft further comprises an
hardware anchor mechanism for attachment of at least one piece of fixation
25 attachment hardware, and

30 an alignment rod comprising an elongated shaft with an engaging portion
arranged at the distal end of the shaft designed to insert into the opening and
cooperatively engage the inner anchor chamber, and an elongated portion arranged
at the proximal end of the shaft, the elongated portion of the alignment rod having
an outer diameter less than or equal to that of the hardware anchor mechanism;

35 at least one piece of fixation attachment hardware designed to slide down the
alignment rod and cooperatively engage the proximal hardware anchor mechanism
such that the at least one fixation attachment is fixedly attached thereto, the at
least one fixation attachment further being designed to fix the at least one spinal
adjustment device in place.

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34. A vertebral alignment/fixation method comprising:

attaching a vertebral anchor means to a vertebral body;

inserting an alignment rod into a cannulation of the vertebral body;

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aligning the vertebral body with the alignment rod;

sliding a piece of fixation attachment hardware down the alignment rod onto
the vertebral anchor means;

tightening the piece of fixation attachment hardware onto the vertebral
anchor means; and

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attaching a spinal adjustment device onto the fixation attachment hardware
to fix the vertebral body in the chosen alignment.

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